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ELG Docket No. ILL05-040-DIV-US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named

Inventor: Yi Lu

Examiner: Tracy Ann Vivlemore

Serial No.: 10/702,676

Filing Date: November 6, 2003

Group Art Unit: 1635

Title: NUCLEIC ACID ENZYME
BIOSENSORS FOR IONS

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AND
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Paul E. Rauch, Ph.D., Registration No. 38,591

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INFORMATION DISCLOSURE STATEMENT

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Dear Sir:

In accordance with the provisions of 37 C.F.R. § 1.56, Applicants request that citation and examination of the references identified on the attached Form PTO-1449, required copies of which are enclosed herewith in accordance with 37 C.F.R. §1.98, be made during the course of examination of the above-referenced application for United States Letters Patent.

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Respectfully submitted,


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Form PTO-1449 (Rev. 8-88)	Attorney Docket No. ILL05-040-DIV-US	Serial No. 10/702,676
	Applicant: Yi Lu	
	Filing Date: November 6, 2003	Group: 1635

INFORMATION DISCLOSURE CITATION
(Use several sheets if necessary)

U.S. PATENT DOCUMENTS

Examiner Initials*		Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
	Z11	5,663,064	09/1997	Burke, et al.			
	Z12	6,110,462	08/2000	Barbas, et al.			
	Z13	6,630,306	10/2003	Breaker			
	Z14	2003/0215810	11/2003	Lu, et al.			

FOREIGN PATENT DOCUMENTS

Examiner Initials*		Document Number	Date	Country	Class	Subclass	Translation	
							Yes	No
	Y15	WO 02/22882	03/2002	WO				
	Y16	WO 03/068963	08/2003	WO				
	Y17	WO 03/095648	11/2003	WO				
	Y18	2004/081235	09/2004	WO				
	Y19	EP 1 312 674	05/2003	EP				
	Y20	WO 01/73123	10/2001	WO				
	Y21	WO 01/51665	07/2001	WO				
	Y22	WO 01/00876	01/2001	WO				
	Y23	WO 98/04740	02/1998	WO				

Examiner Initials*		OTHER ITEMS - NON PATENT LITERATURE DOCUMENTS	
		Include, as applicable: Author, Title, Date, Publisher, Edition or Volume, Pertinent Pages	
	X2	Aggarwal, S.K., et al., "Determination of lead in urine and whole blood by stable isotope dilution gas chromatography-mass spectrometry", Clinical Chemistry, vol. 40, no. 8, pp. 1494-1502, (1994).	
	X3	Alivisatos, A.P., et al., "Organization of "nanocrystal molecules" using DNA", Nature, vol. 382, pp. 609-611, (1996).	
	X7	Bannon, D.I., et al., "Graphite furnace atomic absorption spectroscopic measurement of blood lead in matrix-matched standards", Clinical Chemistry, vol. 40, no. 9, pp. 1730-1734, (1994).	
	X9	Berens, C., et al., "A tetracycline-binding RNA aptamer", Bioorganic & Medicinal Chemistry, vol. 9, pp. 2549-2556, (2001).	
	X16	Bowins, R.J., et al., "Electrothermal isotope dilution inductively coupled plasma mass spectrometry method for the determination of sub-ng ml ⁻¹ levels of lead in human plasma", Journal of Analytical Atomic Spectrometry, vol. 9, pp. 1233-1236, (1994).	

Form PTO-1449 (Rev. 8-88)	Attorney Docket No. ILL05-040-DIV-US	Serial No. 10/702,676
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X18	Breaker, R.R., "DNA aptamers and DNA enzymes" Current Opinion in Chemical Biology, vol. 1, pp. 26-31, (1997).
X30	Brust, M., et al., "Novel gold-dithiol nano-networks with non-metallic electronic properties", Advanced Materials, vol. 7, no. 9, pp. 795-797, (1995)
X41	Cake, K.M., et al., "In vivo x-ray fluorescence of bone lead in the study of human lead metabolism: serum lead, whole blood lead, bone lead, and cumulative exposure", Advances in X-Ray Analysis, vol. 38, pp. 601-606, (1995).
X42	Camara Rica, C., et al., "Determination of trace concentrations of lead and nickel in human milk by electrothermal atomisation atomic absorption spectrophotometry and inductively coupled plasma emission spectroscopy", The Science of the Total Environment, vol. 22, pp. 193-201, (1982).
X50	Chartrand, P., et al., "Effect of structural modifications on the activity of the leadzyme", Biochemistry, vol. 36, no. 11, pp. 3145-3150, (1997).
X51	Chen, J., et al., "Synthesis from DNA of a molecule with the connectivity of a cube", Nature, vol. 350, pp. 631-633, (1991).
X52	Chen, C-T., et al., "A highly selective fluorescent chemosensor for lead ions", J. Am. Chem. Soc., vol. 124, pp. 6246-6247, (2002).
X55	Chinnapen, D.J.F., et al., "Hemin-stimulated docking of cytochrome c to a hemin--DNA aptamer complex", Biochemistry, vol. 41, no. 16, pp. 5202-5212, (2002).
X73	Dubois, L.H., et al., "Synthesis, structure, and properties of model organic surfaces", Annu. Rev. Phys. Chem., vol. 43, pp. 437-463, (1992).
X87	Feldman, B.J., et al., "Determination of lead in blood by square wave anodic stripping voltammetry at a carbon disk ultramicroelectrode", Analytical Chemistry, vol. 66, no. 13, pp. 1983-1987, (1994).
X88	Ferguson, A., et al., "A novel strategy for selection of allosteric ribozymes yields riboreporter TM sensors for caffeine and aspartame", Nucleic Acids Research, vol. 32, no. 5, pp. 1756-1766, (2004).
X100	Granadillo, V.A., et al., "The influence of the blood levels of lead, aluminum and vanadium upon the arterial hypertension", Clinica Chimica Acta, vol. 233, pp. 47-59, (1995).
X105	Hartig, J.S., et al., "Reporter ribozymes for real-time analysis of domain-specific interactions in biomolecules: HIV-1 reverse transcriptase and the primer-template complex", Angew. Chem. Int. Ed., vol. 41, no. 22, pp. 4263-4266, (2002).
X106	He, X-x., et al., "Bioconjugated nanoparticles for DNA protection from cleavage", J. Am. Chem. Soc., vol. 125, no. 24, pp. 7168-7169, (2003).
X111	Hock, B., "Antibodies for immunosensors, A review", Analytica Chimica Acta, vol. 347, pp. 177-186, (1997).
X114	Hoogstraten, C.G., et al., "NMR solution structure of the lead-dependent ribozyme: Evidence for dynamics in RNA catalysis", J. Mol. Biol., vol. 284, pp. 337-350, (1998)
X122	Iqbal, S.S., et al., "A review of molecular recognition technologies for detection of biological threat agents", Biosensors & Bioelectronics, vol. 15, pp. 549-578, (2000).
X124	Jagner, D., et al., "Determination of lead in microliter amounts of whole blood by stripping potentiometry", Electroanalysis, vol. 6, pp. 285-291, (1994).
X132	Jin, R., et al., "What controls the melting properties of DNA-linked gold nanoparticle assemblies?", J. Am. Chem. Soc., vol. 125, no. 6, pp. 1643-1654, (2003).
X137	Katahira, M., et al., "Two metal-binding sites in a lead ribozyme bound to competitively by Pb ²⁺ and Mg ²⁺ : Induced structural changes as revealed by NMR", European Journal of Biochemistry, vol. 255, pp. 727-733, (1998).
X140	Khan, R., et al., "Interaction of retroviral nucleocapsid proteins with transfer RNA ^{Phe} : a lead ribozyme and ¹ H NMR study", Nucleic Acids Research, vol. 24, no. 18, pp. 3568-3575, (1996).
X141	Khosraviani, M., et al., "Detection of heavy metals by immunoassay: Optimization and validation of a rapid, portable assay for ionic cadmium", Environ. Sci. Technol., vol. 32, no. 1, pp. 137-142, (1998).
X143	Kim, M.H., et al., "Activation and repression of the activity of a lead ribozyme by the combination of Pb ²⁺ and Mg ²⁺ ", J. Biochem., vol. 122, no. 5, pp. 1062-1067, (1997).
X148	Koizumi, M., et al., "Allosteric ribozymes sensitive to the second messengers cAMP and cGMP", Nucleic Acids Symposium Series, no. 42, pp. 275-276, (1999).

Form PTO-1449 (Rev. 8-88)	Attorney Docket No. ILL05-040-DIV-US	Serial No. 10/702,676
INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)	Applicant: Yi Lu	
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	X149	Kruger, K., et al., "Self-splicing RNA: autoexcision and autocyclization of the ribosomal RNA intervening sequence of the Tetrahymena", Cell, vol. 31, pp. 147-157, (1982).
	X152	Lebruska, L.L., "Selection and Characterization of an RNA Decoy for Transcription Factor NF- κ B", Biochemistry, vol. 38, no. 10, pp. 3168-3174, (1999).
	X154	Lee, S-W., et al., "Ordering of quantum dots using genetically engineered viruses", Science, vol. 296, pp. 892-895, (2002).
	X155	Legault, P., et al., "Order, dynamics and metal-binding in the lead-dependent ribozyme", J. Mol. Biol., vol. 284, pp. 325-335, (1998).
	X157	Lemieux, S., et al., "Modeling active RNA structures using the intersection of conformational space: application to the lead-activated ribozyme", RNA, vol. 4, pp. 739-749, (1998).
	X167	Liu, H-W., et al., "Determination of cadmium, mercury and lead in seawater by electrothermal vaporization isotope dilution inductively coupled plasma mass spectrometry", Spectrochimica Acta Part B Atomic Spectroscopy 54, pp. 1367-1375, (1999).
	X172	Liu, J., et al., "Highly dispersible molecular sieve carbon nanoparticles", Chem. Mater., vol. 16, no. 22, pp. 4205-4207, (2004).
	X174	Liu, Z., et al., "Assemblage of signaling DNA enzymes with intriguing metal-ion specificities and pH dependences", J. Am. Chem. Soc., vol. 125, no. 25, pp. 7539-7545, (2003).
	X186	Marcus, A.H., et al., "Estimating the contribution of lead based paint to soil lead, dust lead, and childhood blood lead", American Society for Testing and Materials Spec. STP 1226, pp. 12-23, (1995).
	X190	Mecklenburg, M., et al., "A strategy for the broad range detection of compounds with affinity for nucleic acids", Analytica Chimica Acta, vol. 347, pp 79-86, (1997).
	X191	Mei, S.H.J., et al., "An efficient RNA-cleaving DNA enzyme that synchronizes catalysis with fluorescence signaling", J. Am. Chem. Soc., vol. 125, no. 2, pp. 412-420, (2003).
	X192	Meli, M., et al., "Adenine-aptamer complexes: A bipartite RNA site that binds the adenine nucleic base", The Journal of Biological Chemistry, vol. 277, no. 3, pp. 2104-2111, (2002).
	X201	Mullah, B., et al., "Automated synthesis of double dye-labeled oligonucleotides using tetramethylrhodamine (TAMRA) solid supports", Tetrahedron Letters, vol. 38, no. 33, pp. 5751-5754, (1997).
	X202	Nazarenko, I.A., et al., "A closed tube format for amplification and detection of DNA based on energy transfer", Nucleic Acids Research, vol. 26, no. 12, pp. 2516-2521, (1997).
	X203	Nazarenko, I.A., et al., "Defining a Smaller RNA Substrate for Elongation Factor Tu", Biochemistry, vol. 34, no. 8, pp. 2545-2552, (1995).
	X205	Niemeyer, C.M., "Nanoparticles, proteins, and nucleic acids: Biotechnology meets materials science", Angew. Chem. Int. Edition, vol. 40, pp. 4128-4158, (2001).
	X206	Nieuwlandt, D., et al., "In Vitro Selection of RNA Ligands to Substance P", Biochemistry, vol. 34, no. 16, pp. 5651-5659, (1995).
	X213	Ohmichi, T., et al., "Role of Nd ³⁺ and Pb ²⁺ on the RNA cleavage reaction by a small ribozyme", Biochemistry, vol. 36, no. 12, pp. 3514-3521, (1997).
	X220	Pan, W., et al., "Isolation of virus-neutralizing RNAs from a large pool of random sequences", Proc. Natl. Acad. Sci. USA, vol. 92, pp. 11509-11513, (1995).
	X221	Park, S-J., et al., "Array-based electrical detection of DNA with nanoparticle probes", Science, vol. 295, pp. 1503-1506, (2002).
	X222	Parsons, P.J., et al., "A rapid Zeeman graphite furnace atomic absorption spectrometric method for the determination of lead in blood", Spectrochimica Acta, vol. 48B, no. 6/7, pp. 925-939, (1993).
	X223	Pavlov, A.R., et al., "Determination of lead in environmental water samples by a rapid and portable immunoassay", ANYL, Book of Abstracts, 219th ACS National Meeting, San Francisco, CA, March 26-30, 2000.
	X231	Qiao, H., et al., "Transferability of blood lead determinations by furnace atomic absorption spectrophotometry and continuum background correction", Clinical Chemistry, vol. 41, no. 10, pp. 1451-1454, (1995).
	X239	Roychowdhury-Saha, M., et al., "Flavin Recognition by an RNA Aptamer Targeted toward FAD", Biochemistry, vol. 41, no. 8, pp. 2492-2499, (2002).

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X240	Ruckman, J., et al., "2'-Fluoropyrimidine RNA-based aptamers to the 165-amino acid form of vascular endothelial growth factor (VEGF ₁₆₅) Inhibition of receptor binding and VEGF-induced vascular permeability through interactions requiring the exon 7-encoded domain", The Journal of Biological Chemistry, vol. 273, no. 32, pp. 20556-20567, (1998).
X250	Scott, W.G., "RNA catalysis", Current Opinion in Structural Biology, vol. 8, pp. 720-726, (1998).
X255	Seeman, N.C., et al., "Emulating biology: Building nanostructures from the bottom up", Proc. Natl. Acad. Sci., vol. 99, suppl. 2, pp. 6451-6455, (2002).
X256	Seeman, N.C., "DNA in a material world", Nature, vol. 421, pp. 427-431, (2003).
X268	Soukup, G.A., et al., "Engineering precision RNA molecular switches", Proc. Natl. Acad. Sci. USA, vol. 96, pp. 3584-3589, (1999).
X270	Srisawat, C., et al., "Sephadex-binding RNA ligands: rapid affinity purification of RNA from complex RNA mixtures", Nucleic Acids Research, vol. 29, no. 2 e4, pp. 1-5, (2001).
X275	Storhoff, J.J., et al., "Programmed materials synthesis with DNA", Chem. Rev., vol. 99, no. 7, pp. 1849-1862, (1999).
X277	Storhoff, J.J., et al., "What Controls the Optical Properties of DNA-Linked Gold Nanoparticle Assemblies?", J. Am. Chem. Soc., vol. 122, no. 19, pp. 4640-4650, (2000).
X279	Streicher, B., et al., "Lead cleavage site in the core structure of group I intron-RNA", Nucleic Acids Research, vol. 21, no. 2, pp. 311-317, (1993).
X280	Sugimoto, N., et al., "Site-specific cleavage reaction catalyzed by leadzyme is enhanced by combined effect of lead and rare earth ions", FEBS Letters, vol. 393, pp. 97-100, (1996).
X282	Tahan, J.E., et al., "Electrothermal atomic absorption spectrometric determination of Al, Cu, Ge, Pb, V and Zn in clinical samples and in certified environmental reference materials", Analytica Chimica Acta, vol. 295, pp. 187-197, (1994).
X283	Takagi, Y., et al., "Survey and Summary: Recent advances in the elucidation of the mechanisms of action of ribozymes", Nucleic Acids Research, vol. 29, no. 9, pp. 1815-1834, (2001).
X289	Telting-Diaz, M., et al., "Mass-produced ionophore-based fluorescent microspheres for trace level determination of lead ions", Analytical Chemistry, vol. 74, no. 20, pp. 5251-5256, (2002).
X295	Tsien, R.Y., "Fluorescent and photochemical probes of dynamic biochemical signals inside living cells", Fluorescent Chemosensors for Ion and Molecule Recognition, (ed. Czarnik, A. W.), chapter 9, pp. 130-146, American Chemical Society, (1993).
X300	Tyagi, S., et al., "Wavelength-shifting molecular beacons", Nature Biotechnology, vol. 18, pp. 1191-1196, (2000).
X301	Ueyama, H., "A novel potassium sensing in aqueous media with a synthetic oligonucleotide derivative. Fluorescence resonance energy transfer associated with guanine quartet-potassium ion complex formation", J. Am. Chem. Soc., vol. 124, no. 48, pp. 14286-14287, (2002).
X323	Whaley, S.R., et al., "Selection of peptides with semiconductor binding specificity for directed nanocrystal assembly", Nature, vol. 405, pp. 665-668, (2000).
X325	Wiegand, T.W., et al., "High-affinity oligonucleotide ligands to human IgE inhibit binding to Fc epsilon receptor I", The Journal of Immunology, vol. 157, pp. 221-230, (1996).
X334	Wittmann, C., et al., "Microbial and Enzyme sensors for environmental monitoring", Handbook of Biosensors and Electronic Noses: Medicine, Food, and the Environment, pp. 299-332, (1997).
X336	Yan, H., et al., "DNA-Templated self-assembly of protein arrays and highly conductive nanowires", Science, vol. 301, pp. 1882-1884, (2003).
X345	International Search Report dated November 21, 2005 for corresponding PCT application number PCT/US2005/001060.
X346	Supplemental International Search Report dated January 10, 2006 for corresponding PCT application number PCT/US2005/001060.
X347	Liu, J., et al., "Size control, metal substitution, and catalytic application of cryptomelane nanomaterials prepared using cross-linking reagents", Chem. Mater., vol. 16, no. 2, pp. 276-285, (2004).

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	X348	Cake, K.M., et al., "Partition of circulating lead between serum and red cells is different for internal and external sources of lead", American Journal of Industrial Medicine, vol. 29, pp. 440-445, (1996).
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